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Biological
& Medical
Serials

New Series, Vol. VII. Nos. 3 and 4

PROCEEDINGS

OF THE

NEW YORK PATHOLOGICAL SOCIETY

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April and May, 1907

PUBLISHED BY THE SOCIETY

FRANCIS CARTER WOOD, Editor
437 West 59th Street, New York, N. Y.

Proceedings

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New York Pathological Society.

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DR. CHARLES NORRIS, *President.*

A CASE OF STREPTOCOCCUS SEPSIS.

J. C. BIERWIRTH, M.D., AND HARLOW BROOKS, M.D.

Dr. J. C. Bierwirth reported the clinical history of a case which was of interest primarily in view of the short duration of the illness. The patient was a woman in her fortieth year who had previously enjoyed good health and who had been under his personal care for about ten years. There was nothing unusual in her previous history except an attack of rheumatism some three or four years before, which had been rather slow in

yielding to medication. As a consequence she had some heart murmur of a mild character. She was the mother of three children, the youngest of whom was seven years of age. On February 23, she first complained of feeling ill with no particular symptoms except fever, headache and a slight sore throat. Her temperature was 101°. Examination of the throat showed a slight reddening of the anterior pillars, nothing more. She had a good deal of sore throat in connection with her previous attacks of rheumatism, but of a much more severe character. Acetanilid was prescribed. At ten o'clock the next night her temperature was 105°, and she complained of severe headache and general aching of the body, and was rather nervous. Five grains of acetanilid were again prescribed. On February 25, the patient's temperature was 103°. There were still no other symptoms except headache and general malaise. It seemed certain that the case was one of influenza. Aconite was given to make her more comfortable. On February 26, the patient had a temperature of 104° and complained of soreness in the index finger of the left hand, which suggested that possibly some latent rheumatism had been set free by the infection. She was given four doses of five grains of aspirin, which resulted in profuse sweating in the afternoon. Her temperature, nevertheless, remained 104°. The patient then complained of very severe pain in the legs, and very careful examination of both legs was made. Nothing abnormal was found either by sight or by touch. A hypodermic of morphine was given and a nurse was secured, as the patient then for the first time looked ill. This might have been due to the continuation of the fever or to the acute pain which she was suffering. The temperature that night was 105°, later it rose to 105.6°; in the morning it was 104.5°. During the night, the

patient, in spite of the hypodermic, complained of pain in her legs, although she was inclined to sleep. The pulse was weak and irregular and there was some slight incoherency of speech at times. The patient was extremely restless. After a sponge bath the temperature fell to 104°. At seven o'clock in the morning of February 27, the patient was much worse; the pulse was very weak and difficult to count. There was also a discoloration on the instep of the left foot which looked like a bruise. This had not been there the night before. At eight o'clock the pulse became imperceptible at the wrist though the femoral pulse could still be felt. Digitalis and strychnin were given as stimulants. The discoloration of the foot spread rapidly. When seen at twelve o'clock the patient was evidently dying. She presented the picture of a person who is bleeding to death, with pinched features and blue lips. Both legs looked almost gangrenous below the knee. They were very hard to the touch and were covered with large watery blebs which extended up on the calves. Saline enemata were ordered and the stimulation was stopped. Dr. Alexander Lambert was called in consultation during the afternoon. When he reached the bedside the patient was clear in her mind but died within ten minutes. The clinical history of the case was an absolute puzzle. In the afternoon permission was fortunately secured for a post-mortem.

* * *

Dr. Harlow Brooks reported the results of the autopsy on Dr. Bierwirth's case.

Post-mortem about four hours after death. The general appearance of the body was that of a person who had bled to death, the skin being the peculiar black and

white color seen in these cases. The arms and hands were absolutely waxy. The legs showed what looked like a moist gangrene. There were blebs over the backs of the calves and along the sides. Puncture of these gave exit to a blood stained serum. Rigor mortis was very pronounced throughout the body. Purpuric spots were looked for but were not present. The organs showed normal structures. The lungs showed edema and slight congestion; the heart looked perfectly soft and had practically no blood in it. There was no blood in the veins of the vena cava or of the lungs. The liver was washed out; there was no blood in the large veins there. The kidneys were white and apparently normal except for the anemia. The mesenteric vessels were notably anemic. The spleen was the only organ which was apparently diseased. It was enlarged about one volume, was deep purple in color and soft in consistency, and presented a mulberry appearance. Cultures were taken from the spleen and from the small amount of blood in the heart. There was no enlargement of the lymph nodes in the neck or of the thoracic and mesenteric nodes. The intestine was gone over from the esophagus to the anus, and nothing was noted except a most striking absence of food. The intestine was absolutely clean. There were no ulcerations. The pancreas was normal. There were slight adhesions around the Fallopian tubes and very slight around the fundus of the uterus. One ovary contained a rather large hemorrhage, There was a marked softening of the right adrenal body. This was as soft as the adrenal usually is several days after death. It was thought to be hemorrhagic softening. The left adrenal seemed to be normal except for fatty infiltration. Incision into the calves, which felt as hard as pieces of wood, showed nothing in the skin ex-

cept the blebs. Beneath the skin there was nothing but blood. The vessels showed no actual rupture, but there seemed to be a diffuse hemorrhage from diapedesis. The arteries seemed to be normal.

The anatomical findings therefore were: Septic condition of the spleen, marked softening of the right adrenal body; and hemorrhage into the muscular tissues of the legs. Cultures from the spleen showed pure culture of streptococcus. This culture was unfortunately lost before its virulence could be studied.

Dr. Brooks was inclined to look upon the case as one of streptococcus sepsis following a mild angina; but the lesions were not those of sepsis and the clinical symptoms were not.

As concerned the lesions found in the adrenal body Dr. Brooks said that the right adrenal was practically destroyed. It showed areas of small round cell infiltration and marked destruction of cells which he took to be parenchymatous degeneration. The left adrenal body showed changes of the same character only differing in degree. A great many cells were practically broken down and dissolved out. Some of them showed degeneration. Many of the veins were filled with leucocytes. Theoretically, Dr. Brooks thought that the case was one of streptococcus infection, such as not infrequently occurs after a mild angina. He believed that early in the infection there was a focus in the adrenal body, causing softening, and that the removal of the adrenal secretion from the circulation resulted in the fall of blood pressure. This was borne out by the feeble pulse; for ten minutes before death no radial pulse could be felt. He was therefore inclined to think this an instance in which localization of the septic lesion in the adrenal body led to a remarkable fall of blood pressure, and that as a re-

sult the blood went into that portion of the body most distant from the central portion, and stayed there simply because there was nothing to push it back. There was no capillary pressure.

Discussion.

Dr. James Ewing expressed his admiration for Dr. Brooks' courage in attempting to explain the condition as he had, though he might not be willing to follow him to a definite conclusion that the lesion of the adrenal worked in the way he had described. Dr. Ewing asked whether Dr. Brooks had considered the possibility that a lodgment of bacteria in the points distant from the heart had had something to do with the condition of the legs. Dr. Ewing also asked whether the blood had been examined during life for anemic or toxic changes in the red cells. He thought that in a case of this sort the true explanation could be reached only after the consideration of a great many factors, each one by itself incompetent to produce the result, but when combined able to bring it about.

Dr. E. Libman asked whether there was any abnormal condition of the blood before the patient had been taken ill. Of course, if a blood culture had been taken during the course of the clinical history the whole case could have been more easily explained. In chronic affections of the adrenals he had seen a tendency to disseminated hemorrhagic rashes, but he had never seen a case in which the condition was localized in one part of the body. He did not think it necessary to explain the case by the absence of adrenal secretion because the other adrenal had been normal and probably was able to produce sufficient secretion. The effect might be pro-

duced by the sympathetic nervous system (in this case plus the probable toxic condition).

Dr. O. H. Schultze said that the theory which Dr. Brooks had formulated, that the condition was due to a sudden fall of blood pressure, seemed to him rather curious. In cases of death from hemorrhage, where there was of course a fall of blood pressure, it was surprising to note on autopsy the amount of venous stasis throughout the organs, even when two or three pints of blood had been lost. That the blood should collect in the legs when a person was in a recumbent posture seemed to him unlikely.

Dr. Bierwirth said that he would like to add that in this case he had happened to know all about the patient's general condition. She was a very nervous woman; but physically she was in excellent health, so that there was no reason to make a blood examination. The clinical history was like that of many cases of influenza which he had seen, and there was nothing in it to lead one to suspect a serious disease. The patient had certainly not been anemic. Dr. Bierwirth had discussed the clinical features of this case with a number of physicians and had yet to find one who had ever seen anything like it, or who could give any explanation of it. The throat infection was extremely mild; there was no congestion; the tonsils and the glands of the neck were not enlarged. There was simply headache, fever, and pain in the legs, until something suddenly happened and the patient died in less than twenty-four hours, with all the blood in her legs.

Dr. T. C. Janeway said that the occurrence of the pain in the legs before the appearance of the discoloration suggested to him that this might possibly be a case of thrombophlebitis. There might have been a throm-

bosis which occurring in the presence of a streptococcus septicemia might have resulted in softening and bleeding into the legs.

Dr. Brooks said that he had of course thought that the condition might be due to thrombus, and for that reason he had almost torn the calves to pieces in trying to find the veins which were thrombosed; but he had been unable to find these. The liver showed a slight increase in the connective tissue and a little brown atrophy, but otherwise was normal. As regarded the presence of inflammatory lesions in the calves, Dr. Brooks could not exclude them, but there was no pus and the skin was not reddened except where the blebs had been raised, and here it was deep purple in color. The femoral vessels were palpable and were examined as high as could be reached. Dr. Brooks did not think there was any lesion of the blood vessels which could have been detected by gross examination, and he had not been able to find any lesion microscopically.

A CASE OF SEPTICEMIA, PROBABLY GONOCOCCAL IN ORIGIN.

A. M. PAPPENHEIMER, M.D.

Dr. A. M. Pappenheimer presented a case of septicemia which was probably gonococcal in origin, giving a brief review of the clinical history and post-mortem examination and of the bacteriological findings. The interest of the case lay in the fact that it was a case of general gonococcal septicemia, originating from suppurative salpingitis with the formation of a pelvic abscess,

and unaccompanied by endocarditis or joint lesions. For permission to report the clinical history, he was indebted to Dr. W. E. Studdiford.

The patient was a young colored woman, twenty-three years of age, whose previous history had no bearing on this illness. Three weeks before admission to Bellevue Hospital she had severe pains in her abdomen and noticed a vaginal discharge. This was all the history which was obtained, as the patient was delirious on admission. She was in the hospital from March 3rd to March 25th, and during that time ran a persistent irregular temperature, 101 to 104°, and was constantly delirious. She developed rather marked meningeal symptoms, so much so that meningitis was suspected. The spinal fluid, however, was clear and sterile. A blood culture which was taken shortly after she entered the hospital, was also sterile. Pelvic examination showed the presence of a large mass in the posterior fornix. There was a profuse purulent vaginal discharge, smears from which showed Gram negative diplococci. A gonococcal septicemia was suspected, and from March 16th until she died, she was treated with injections of Dr. Torrey's anti-gonococcus serum. The only effect noted was a slight lowering of the temperature.

The post-mortem examination was interesting chiefly from a negative point of view. An encapsulated abscess containing a few drachms of thick pus was found in the posterior cul-de-sac between the uterus, rectum and right Fallopian tube. There was no general peritonitis. In general, with the exception of the heart, the organs showed nothing but slight parenchymatous changes. The myocardium, on histological examination, showed areas of round-celled infiltration, degenerative changes in the nuclei, and edema. There was no meningitis.

Smears made from the pus of the abscess showed typical gonococci. Unfortunately the abscess cavity was opened before its presence was recognized and the cultures were overgrown by contaminating bacilli.

Smears from the spleen contained a great number of Gram negative diplococci. Some of these were morphologically typical; others were irregular in size and staining, resembling the involution forms of old cultures, and were difficult to identify positively as bacteria. Ascitic agar streak plates were made from the spleen, but only a few extraneous colonies developed.

A CASE OF COMPRESSION PARAPLEGIA.

V. P. GIBNEY, M.D.

Dr. V. P. Gibney presented a case of compression paraplegia directly due to abscess dissecting on the anterior surface of the canal, from Pott's disease of the third and fourth cervical vertebræ.

A colored girl, six years of age, was admitted to the Hospital for the Ruptured and Crippled on January 31, 1907, with a history of enlarged glands in the neck on the right side for over a year. The glands had been removed at the Polyclinic Hospital and found to be tuberculous. Last June, pain in the back of the neck came on with rigidity and distress on walking. Later she was brought to the Out-Patient Department of the Hospital for the Ruptured and Crippled, and a plaster-of-Paris jacket with head spring was applied. About the first of December the lower limbs became weak, and shortly afterwards paralysis of both upper and lower extremities

developed, so that when she was admitted she had paraplegia as well as brachial paraplegia. There was no deformity of the cervical vertebræ, but the spinal column was quite stiff here and the least movement produced pain and distress. So a "Minerva" jacket (see picture) was applied promptly and immediate relief followed. That is, the child was happy, the

fingers in the right hand began to move, and nothing further developed until February 23, when dyspnea with weak and irregular pulse came on. Strychnin was employed with temporary relief, and a large fenestrum was cut out over the front of the jacket; but relief was only temporary, as death supervened on the morning of February 25.

An autopsy made by Dr. Jeffries revealed a pneumonic process of the lower lobes of both lungs and early miliary tuberculosis. An abscess was uncovered on the

anterior surface of the bodies of the three lower cervical and three upper dorsal vertebræ. Its entire extent was not discovered until the column was removed, when it was found that the intervertebral disk between the third and fourth cervical vertebræ was absorbed and the two vertebræ entirely separated. The pus cavity extended into the spinal column and caused pressure over about two inches of the cord. The specimen shown demonstrated this. The cord was not removed for examination.

A CASE OF ACUTE LYMPHATIC LEUKEMIA.

S. O. SABEL, M.D., AND G. R. SATTERLEE, M.D.

Dr. G. R. Satterlee presented a case of acute lymphatic leukemia clinically suggesting a myelogenous origin, which had been studied by Dr. Sabel and himself. Considerable discussion has recently been concerned with the subject of the origin of the leucocytes in leukemia. Probably the chief cause of the unsettled state of opinion lies in the "imperfection and instability of our knowledge of the histogenesis and interrelation of the different forms of leucocytes". Considerable confusion has also arisen over the naming of the cells. At times the clinical features are too striking to be ignored, and this case had been studied from the clinical standpoint principally. Unfortunately there was no autopsy. In regard to the origin of the leucocytes typical of the disease there are two schools of diverse opinions. The first is that of Ehrlich and his followers; the second that of Pappenheim, Grawitz, and others. Ehrlich believes that two forms of leukemia exist: first, the lymphatic,

due to primary disease of the lymph glands; second, the myelogenous, due to primary disease of the bone marrow; and that it is not possible for the disease of one form to change into that of the other form. The second school considers the bone marrow as the birthplace, pathologically, of all cases of leukemia. Numerous cases of lymphatic leukemia with slight or no enlargement of the lymph glands have been reported. The case reported by Dr. Sabel and Dr. Satterlee could be added to this class of cases and might possibly throw some light on the question of the origin of the leucocytes. Because of the absence of a post-mortem examination the changes in the bone marrow could only be inferred by clinical deduction.

The opportunity for studying this case was offered in the service at the Washington Heights Hospital. The patient was thirty years old, male, white, born in the United States, credit man, married, admitted March 20, died March 31, 1907. Clinical diagnosis, acute lymphatic leukemia. The patient was brought to the hospital in the ambulance complaining of weakness and nose bleed. The family history was negative. His father and mother were both living, one aged sixty-six, the other sixty-two. He had six brothers and two sisters, all alive and well. He was born in New York and had always resided here with the exception of eleven years spent in Ohio. He said that his business was a severe tax on his nervous system. His habits were not good. He was always indoors and took little exercise; his meals and sleep were regular. Though he smoked but moderately he averaged one glass of whiskey a day, and had used to drink heavily.

Previous illness: As a child he had measles, mumps, whooping-cough. He denied all other diseases except

malaria; admitted gonorrhea, but denied syphilis. For the past six months he had noticed an increasing frequency of micturition. For the past two months he had been very weak. He had a slight hemorrhage every time he blew his nose. The stools were of normal consistency but were black. The appetite was very fair. Weakness became more marked, and on March 14 a physician was consulted. On March 18, he lost six ounces of blood by epistaxis. During recurring attacks he lost considerable blood. About this time he noticed dark patches on his leg. These were undoubtedly subcutaneous hemorrhages. On the day of admittance into the hospital he had a severe nasal hemorrhage. When first seen by the ambulance surgeon the patient was very restless and when placed in an erect position fainted.

Physical examination, March 21, showed a fairly well nourished man; musculature flabby; appeared weak; eyes protruding, scleræ of a pearly hue, pupils dilated, conjunctivæ blanched. The mucosa was very pale; there were slight hemorrhages from the gums. The nasal cavity showed a blood clot from recent hemorrhage. Of the glands of the neck only one was palpable. This was about the size of a pea and was firm in consistence. All other superficial lymph glands were negative. The tonsils were not enlarged. The thyroid appeared normal. There were several small subcutaneous ecchymotic areas on the left arm and on the back of the hand. There were four or five spots on the leg. The heart was not enlarged; there was a blowing systolic murmur at the apex. The vessel walls showed no sclerosis. Pulse was 84, regular, and easily compressible, and of 130 mm. tension. The lungs showed nothing abnormal. Neither the liver nor the spleen was palpable. The reflexes were exaggerated. There was moderate ankle clonus. Perception

of heat and cold was not very keen. On admission the patient's temperature was 100.4°; respirations, 22. Blood examination showed white cells, 120,000; red blood cells, 1,500,000; hemoglobin, 15 per cent.; index, 0.5. Differential count showed

Polynuclear leucocytes,	9	per cent.
Large lymphocytes,	78	"
Small "	9	"
Transitionals,	3	"
Myelocytes,	1	"

There was quite marked poikilocytosis and no nucleated red cells.

The next day the patient was put on iron and arsenic and this medication was continued. Patient felt much better, temperature normal, Blood examination showed practically the same conditions. The urine was amber and alkaline; specific gravity, 1.022; trace of albumin; triple amorphous phosphates, and a few epithelial cells.

Blood examination the next day was practically the same. In fresh drop the red blood cells quickly massed together and this could be distinguished by the unaided eye. Fibrin formation was very rapid; and the individual strands between the red cells were very coarse.

March 24: Pallor had become more marked. Blood examination showed white cells, 71,875. Red cells were slightly increased, to 1,720,000; hemoglobin; 15 per cent. Quite marked degeneration of the nuclei and cytoplasm of the leucocytes was noticed.

March 25: Very marked constipation. Urine showed specific gravity, 1.015; no albumin; no sugar; large amount of indican; microscopically there were a number of polynuclears and quite a few large lymphocytes.

March 26: Pulse, temperature, and respirations

normal. Neither the spleen nor any of the lymphatic glands, with the exception of the one in the cervical region, were palpable.

March 27: Gums bled slightly. Patient complained of pain in the head.

March 28: Temperature rose to 101°; pulse, 122. Patient complained of extreme soreness of the gums from which there were slight hemorrhages. Thirty to forty ounces of urine were passed in the twenty-four hours. White cells were 25,100; hemoglobin, 20 per cent. (through an error the red cells were not counted). Differential count showed

Polynuclear leucocytes,	12.5	per cent.
Large lymphocytes,	74.0	"
Small "	4.5	"
Transitionals,	6.0	"
Polynuc. eosinophiles,	1.0	"
Large mono. "	1.0	"
Myelocytes,	1.0	"

March 29: Temperature, 99 to 101.2°; pulse, 108 to 120; respirations, 24. Patient was slightly delirious at times. There were hemorrhages from the nose and gums; he complained of soreness in the thighs. Spleen was palable, though the enlargement was very slight. Urine was amber, slightly cloudy, flocculent; specific gravity, 1.010; no albumin; no sugar; no indican; polynuclear leucocytes and large lymphocytes. A moderate number of red cells and a few granular casts were found, showing that there were some hemorrhages in the urinary tract. Blood examination showed 44,000 white cells; red cells, 940,000; hemoglobin, 20 per cent.; index, 1.08.

March 30: Patient much weaker; he was in a constant condition of delirium and stupor. Gums bled continuously. Face cyanotic. Tenderness over the spleen

and tibia. Patient urinated involuntarily. Temperature 102 to 103.4°; pulse 106 to 120; respirations, 22 to 26.

March 31: After a restless night the patient complained of severe thirst; breathing became difficult; and death occurred.

In this case, the blood picture of which was that commonly called acute lymphatic leukemia, the only symptoms were the numerous small hemorrhages, loss of strength, constipation, and appearance of anemia; there was no enlargement of the spleen or lymphatic glands, with the exception of one cervical gland. The patient was under observation eleven days, but not until the ninth day was the spleen palpable or tender; and for the first time evidence of tenderness upon pressure over the tibia and femur was then noted. On the following day there was soreness in the thighs. In the absence of any enlargement of the lymphatic glands, and the very slight though late enlargement of the spleen, the soreness in the thighs and the tenderness over the spleen and long bones which was very marked, suggest that the original lesion productive of the blood changes was located in the bone marrow and the spleen. It was unfortunate that these clinical deductions could not be corroborated by a necropsy.

Discussion.

Dr. F. C. Wood said that in connection with this case of Dr. Satterlee's he would like to bring up a point which had greatly interested him; that is, as to how far one might go in making a diagnosis of lymphatic leukemia from the blood count alone. He had recently seen a number of interesting cases with high relative and absolute lymphocyte counts which were evidently not lymphatic leukemia. These cases all recovered. Some of them

had had syphilis which might have accounted for the lymphocytes and some had general glandular enlargement. All, however, had left the hospital in good condition. He had seen other cases which did not seem to be lymphatic leukemia from the blood, cases in which the lymphocytosis was not very high, although at autopsy lymphatic bone marrow was found. These facts had rather shaken his belief in the possibility of a diagnosis of obscure cases of this type of disease.

Dr. E. Libman said he thought that if these cases were regarded as a type of reaction of the bone marrow or other blood forming organs to certain known and unknown infections and intoxications it would be much easier to understand the atypical cases. It was possible to have all kinds of findings in infections, and he thought the safest way would be to say more often that one was dealing with a lymphemic or myelemic picture (and so on), and then try to find out what the picture was due to, or what the lesion was. He had seen a case recently of a girl suffering apparently from influenza. A few days later a gland at one side of the neck enlarged; her temperature was up (102° to 103°); white cells, 8,000, most of which were large mononuclear elements. There were also a few nucleated red cells and neutrophile myelocytes. She shortly developed bone tenderness and a large spleen. After about six weeks she entirely recovered and her blood had been negative ever since. In other words, this was a case with a peculiar reaction of the blood to an infection. In such cases one must be certain that the infection preceded the blood changes. In a case Dr. Libman had seen recently, of apparent hemorrhagic diathesis, in which streptococci were found in the blood, it was found that the infection was secondary (from the throat) to an acute leukemia.

Dr. Satterlee said he agreed with Dr. Wood in that he thought a great deal hinged on the origin of the leukemia. This blood showed a leukemic picture. The patient had not been seen before and it was impossible to tell whether he had had an infection. A great deal hinged also on what these different cells were called. Some authors call them one thing, and some another. He would classify this case with the leukemias on account of the clinical symptoms, the high leucocyte count (120,000) and the large percentage of the typical large lymphocytes.

A CASE OF SYPHILIS OF THE HEART.

T. C. JANEWAY M.D., AND W. W. WAITE, M.D.

Dr. T. C. Janeway reported a case of syphilis of the heart, the interest in the clinical history hinging on the post-mortem finding of a rather rare lesion. The patient was a strong Irish laborer, forty years of age. He had had syphilis at nineteen and had suffered from rheumatic pains ever since. He entered the hospital having had shortness of breath for some months particularly at night. There were typical signs of aortic insufficiency. There was a marked collapsing pulse and a large range of pulse pressure. The history was a straightforward one of a rather badly treated syphilis. A diagnosis of syphilitic aortitis with aortic insufficiency was made. The absence of any systolic murmur and of any noticeable diminution in the suddenness of the pulse was rather striking in view of the autopsy. This showed a marked aortic stenosis with absence of any of the clinical signs in addition to moderate aortic leakage. The ex-

planation of the absence of murmur was obvious; the aorta was not narrowed at any one point, but for a considerable distance; therefore there was no chance for the production of abnormal currents beyond the point of contraction. The man was in the wards for ten days, complaining only of inability to lie down without dyspnea. A few days before death there was a small effusion in the chest, then suddenly he developed edema of the lungs and died inside of five minutes.

Dr. W. W. Waite demonstrated the autopsy findings in this case. The important finding was in the heart. On opening the thorax there was a large excess of fluid in both pleural cavities and in the pericardial cavity. The upper portion of the pericardial cavity was obliterated and the aorta and pulmonary artery were firmly bound together. On removing the heart it was found considerably enlarged, weighing 515 grams. On section, the right side was free and the valves were in good shape. The pulmonary artery was free, and the surface of the intima was of a peculiar glairy appearance and of a pale pinkish color, due to numerous fine vessels present in the deeper substance. In the heart muscle, directly beneath the right pulmonary segment, there was a small, white, well defined patch, about four mm. in diameter, which extended into the heart substance. Most of this was removed for microscopical examination. The left auricle was free. The segments of the mitral valve were slightly thickened along the line of closure. The wall of the ventricle was thickened, the trabeculæ coarse, and the cavity larger than normal. On section, the wall of the base of the aorta was found markedly thickened with distinct puckering of the intima and a narrowing of the lumen. The remarkable thing was that the ascending aorta was completely surrounded by a

dense, firm, white, semi-translucent, very elastic-like tissue. This increase of connective tissue partly surrounded the pulmonary artery and extended to the arch and about the vessels arising from it. The aortic segments were slightly thickened. At the junction of the right and posterior cusps there was a large and deep ulcerating area. The edges of the ulcer were raised and thickened. No sections were made of this area, but it was considered as a broken-down gumma.

Microscopical examination showed that the nodule in the heart muscle was a gumma with a large amount of connective tissue, fibrous cells, small round cells, and many giant cells. No tubercle bacilli could be found. A section of the firm fibrous tissue about the aorta showed much the same picture, except that there were fewer giant cells and more connective tissue of a hyalin nature. In the more recent deposits there were numerous small round cells of the lymphoid type. The small vessels in the intima and media were dilated and filled with blood. The intima itself was greatly thickened, and necrotic, and showed hyalin degeneration. On the descending aorta there was nothing but patchy sclerosis. The lymph glands were enlarged and pinkish in color. There was some hypertrophy of the lymphoid tissue. The heart muscle itself was fairly well preserved, showing some chronic interstitial myocarditis with hypertrophy. There was also a small gumma on the surface of the liver.

Discussion.

Dr. Horst Oertel said that while he did not wish to enter into any discussion of the histogenesis of gummata, there were one or two points in the specimens which he had examined under the microscope to which

he would like to call attention. The first was the occurrence of a very large number of giant cells in the sections from the gumma of the heart muscle. The discussion as to the occurrence of giant cells in gummata had been recently revived, and some authors had taken the stand that these cells do not occur unless the gumma is complicated with tuberculosis. This case showed a large number of giant cells, and careful examination showed nothing to indicate the presence of tuberculosis. Second, as to the origin of giant cells; some have thought that all giant cells were transverse sections of thrombosed vessels. The sections under the microscope showed very plainly that nothing of that kind existed here, but that they probably resulted from fusion or overgrowth of granulomatous cells. Another point was the presence of a very large number of eosinophiles. Dr. Oertel had not seen these very frequently in gummata and had been very much struck by their appearance in this case in the sections from the heart muscle.

SPECIMEN SHOWING RARE SEQUELÆ OF INTUBATION.

BINFORD THRONE, M.D.

One of the rarest complications of intubation is the development of a pretracheal abscess. I have seen this once at the Kingston Avenue hospital since the first of July, 1906. During this time we had about one hundred and fifty intubation cases. At the Willard Parker Hospital I saw three cases. Of these three, one was in a series of cases of which I kept careful records. Of these, one hundred and fifty-two were intubation cases.

The following is a short clinical history of these three cases:

Case 1: N. C., aged four years; seven days illness; admitted on October 4; intubated before admission. Abscess developed on the twenty-first day after intubation. The case was intubated thirteen times before the opening of the abscess. It was extubated three times; and the tube was coughed up nine times. The abscess was a soft mass about two inches in diameter situated in the median line of the neck below the larynx and just above the isthmus of the thyroid. It developed very rapidly, was opened on October 25, when about one and one-half ounces of pus discharged. There was no communication with the larynx. The cervical glands were involved secondarily, and those on the right side were incised on November 1.

Case 2: J. S., aged fifteen months; eight days illness; admitted October 11, 1904; intubated before admission. The case was intubated eight times before the formation of the abscess. It was extubated three times; and the tube was coughed up four times before the opening of the abscess. The tube was coughed up twice after the abscess was drained and the case was extubated once. The abscess was opened on the eleventh day after the first intubation.

Case 3: G. B., aged three years and nine months; two days illness; intubated before admission; admitted on March 9, 1905. The abscess was first noticed on March 20, and opened on March 21. The abscess was opened on the fourteenth day after the first intubation. The case was intubated four times before and eight times after the abscess was formed.

All of the above cases recovered and were discharged.

The patient from whom the specimen presented was taken was admitted to the Kingston Avenue Hospital on March 5, 1907. This patient was three years and one month old, and was admitted with the following history. Patient had been intubated twenty-one days previously, was extubated once, and re-intubated some time during the interval between the first intubation and the day prior to admission to the hospital. The history was that the physician who had intubated the child had tried to extubate on March 4, and again on March 5, both times unsuccessfully. Upon admission the patient was suffering from extreme dyspnea. On examining the larynx no tube could be found. A 4–5 year rubber tube was carefully and slowly inserted into the larynx and this tube at no time struck any foreign body. Introduction of this tube relieved the dyspnea somewhat. Physical examination of the child showed exaggerated breathing, tubular in character over the right lung, and greatly diminished respiratory murmur and no expansion on the left side of the thorax. A diagnosis of occlusion of the left bronchus by an intubation tube which had been pushed through the larynx was made. The condition of the child was so grave that an operation to remove this tube was not considered justifiable. A pretracheal abscess which had been opened before admission was present. The duration of this was not known. On March 8, marked emphysema of the subcutaneous tissues of the right side of the neck extending down over the upper part of the chest to the second rib was present. The child died on March 9.

Permission having been obtained, the larynx, trachea and bronchi were removed. In the lower part of the larynx extending into the left bronchus a three year rubber intubation tube was found. The head of this tube

was about one-half inch below the lower end of the 4–5 year rubber tube which had been inserted on admission. Upon the anterior wall of the trachea and a little to the right of the median line, where the lower end of the intubation tube came into contact with it, there was an ulcerated area, about 1-32 of an inch in diameter, extending entirely through the wall of the trachea. In the larynx the vocal cords were entirely gone. An ulceration was present on either side of the median line, extending through the cricothyroid membrane, about 1-16 of an inch in diameter. Ulcerations were also seen at the base of the epiglottis and on the aryepiglottic folds. The cricoid cartilage was intact. Lying upon the anterior wall of the trachea, above the isthmus of the thyroid and just above the origin of the inferior constrictor of the larynx, was a small lymph node. This lymph node drained the upper part of the trachea and the lower part of the larynx, and it was at this site that the first swelling was seen.

The specimen showed three points of interest: First, ulceration of the larynx extending through the cricothyroid membrane. This was the starting point of the infection which caused the pretracheal abscess. Second, ulceration extending through the trachea where the lower end of the tube had been in contact with it. This was the starting point of the emphysema. Third, an intubation tube pushed through the larynx into the trachea and bronchus without rupture of the cricoid cartilage.

A CASE OF BILATERAL SUPERNUMERARY INDEX FINGER REPLACING THE THUMB.

L. T. LE WALD, M.D.

Dr. L. T. Le Wald presented a case of bilateral supernumerary index finger replacing the thumb which he wished to put on record. One frequently saw supernumerary fingers which were rudimentary affairs, but in the case presented the thumb had three phalanges and resembled a finger, and more closely resembled the index finger. The X-ray photograph had brought out not only the additional phalanx but certain other points which tended to show that this in its development was a finger rather than a thumb. The patient was a man of twenty-eight years of age, born in Virginia. The deformity was not present in any other member of the family; one of his brothers had double jointed wrists. The case had come to notice on examination for enlistment in the army. Prof. Huntington, of Columbia University, had been consulted and had stated that in a large number of dissections this deformity had never come under his observation. On searching the literature, however, Dr. Le Wald had found a case reported by Annandale in 1864. In Annandale's case the hand was perfectly developed in every way except that the thumb was like a long forefinger, having three phalanges. The patient was a girl who was otherwise well formed. The deformity in Annandale's case was apparently unilateral. In the present case the thumb showed the peculiarity in both hands. The palmar surface of the thumb instead of being shallow was more rounded out, like that of a finger. The last joint was slightly flexed instead of being extended. The first metacarpal was nearly twice as

long as in a normal thumb and resembled that in a finger. Instead of classing this deformity as a case of supernumerary phalanx in the thumb, Dr. Le Wald thought it might be better to consider it as a replacement of this member by a finger.

THE PRESENCE OF AMEBÆ IN THE MOUTHS OF HEALTHY INDIVIDUALS.

L. T. LE WALD, M.D.

Dr. L. T. Le Wald presented a preliminary report of investigations which he had been carrying on as to the occurrence of amebæ in the mouths of healthy individuals. The subject had been brought forward because there seemed to be a great deal of question as to the constancy of this organism in the mouth. It has been reported in pathological conditions in the mouth and upper respiratory tract. In Delafield and Prudden's Pathology it is stated that species of ameba have been found parasitic in the human mouth, intestine, and bladder. Braun, in his book on animal parasites in man, which is probably the most complete work one can consult, states that Ameba gingivalis, buccalis, and dentalis have been reported in the mouth. Of these three species Braun thinks the last one may be disregarded as its discoverer has himself suggested the possibility of his having mistaken salivary corpuscles for amebæ. The other species have been found on the tartar of teeth.

Dr. Le Wald had taken up this study some time ago while in the tropics. The first examination showed amebæ which looked like Ameba coli. Of the following

cases some showed amebæ and some did not. Dr. Le Wald then began a systematic study of scrapings from the mouth for amebæ, and made a considerable number of observations while still in the tropics. In a series of scrapings from the mouths of Filipinos, for instance, there were fifteen positive and four negative. He had carried on these observations in the United States by using a warm stage so as to simulate tropical conditions, and had been able to convince himself at once that these amebæ could be demonstrated in the mouth almost constantly, no matter how much care was taken of the teeth. In the first examination of 100 cases he had obtained positive results in 71. In going over some of the negative cases and making repeated examinations he had found amebæ in four more; and he felt that with repeated examinations they could be demonstrated in most, if not all, of the other cases.

The morphology of these organisms had not been worked out completely, and he hoped to undertake some investigations to demonstrate what the correct designation of this organism should be. He considered it probably identical with the gingivalis and buccalis, and would suggest that one of these names be retained or the organism called *Ameba oralis hominis* which would indicate its constant presence in man.

The technique was not very simple. If one merely took saliva from the mouth, or even tartar from the teeth, he would not find the organism. It was necessary to go a little deeper and scrape away the tartar and work a sterilized platinum loop under the gum, bringing away a sort of translucent gelatinous material. This should be put at once on a slide on a warm stage. If the material was very thick a little saliva should be added, and the specimen then covered with a cover glass. The organ-

ism was from 10 to 20 micra in diameter. It was always possible to distinguish it on a warm stage by its motility. There could be no question of confusing it with epithelial cells or with leucocytes which are commonly present in large numbers.

Dr. Le Wald had examined persons coming from all parts of the country and from abroad, and the constancy with which the organism had been found left no doubt in his mind as to its presence in the human mouth in health, equalling in this respect the presence, for instance, of the B. coli communis in the intestine.

Active amebæ were exhibited under the microscope.

EXPERIMENTAL BLASTOMYCOTIC LESIONS.

HANS ZINSSER, M.D.

It would be a needless waste of time to introduce my communication by a review of the literature upon pathogenic blastomycetes. This, since Busse's paper in 1894, has accumulated until it is now quite formidable; and, furthermore, it has been very thoroughly collected in the papers of Ricketts, Gilchrist, Hektoen, and others.

The organisms with which it has been my privilege to do a few simple experiments were cultivated from a case in the care of Prof. Brewer, the clinical details of which were reported at the last meeting of this Society.

The first cultures were made from the pus as discharged from the abscess, which, morphologically, contained besides the organisms in question, a Gram-positive coccus which did not appear in the cultures after incubation. This apparent inhibitory effect on the other

organism is in contrast to Hektoen's case, where it was difficult to separate the organism from a pseudodiphtheria bacillus, but agrees with the experience of Gilchrist and Stokes.

There was no difficulty about cultivation, small, raised, punctate colonies appearing after about forty-eight hours on glycerin-agar slants. Morphologically, the organisms show the following characteristics:

They are almost uniformly round; isolated, slightly oblong forms are occasionally seen in old cultures. They vary much in size, ranging from that of a blood platelet to two or three times that of a red blood cell. They are composed of a definite cell membrane which appears doubly contoured and quite thick. About this, in the first cultures out of the subject and in the tissues of animals, there appears an envelope resembling the capsule of some bacteria. This has disappeared in old cultures and more recent transplants. Within the cell membrane the protoplasm, in unstained hanging-drop preparations, appears granular and is vacuolated. The granules occasionally exhibit Brownian movements, and are highly refractive. The organisms take all the usual aniline dyes easily, and are, by the usual methods, invariably overstained so that little or no structure can be made out. Structures can be made out in fixed smears with Giemsa, Wright's, Jenner's, the eosin-azure stain of Prof. Wood, and aqueous thionin; but are difficult of interpretation. There are usually one or two larger eccentrically placed bodies taking the nuclear stain about which lie numerous smaller granulations which are equally distributed throughout the protoplasm. Often the larger bodies, when encapsulated, assume a crescentic form. Whether these are degeneration phenomena or not, I was unable to determine. On agar

these organisms grow easily, producing in forty-eight hours at 37° C., a small colony the structure of which is not unlike that of a staphylococcus colony. On agar streaks they grow to only a slight depth, but actively on the surface, heaping up in a deep, yellowish creamy growth. On potato, heavy and whiter. On litmus milk, growth, no change. On gelatin, no liquefaction; but this is due possibly to the almost imperceptible growth at room temperature.

Unlike most forms described, they grow, at present, very poorly on all fluid media and to this may be due the absence of fermentation in dextrose, lactose and saccharose Smith tubes, and in dextrose, lactose, galactose, maltose, mannit, saccharose, levulose, and dextrin tubes of the Hiss serum waters. The slow but definite increase, however, which this organism has already shown in its powers of growth on artificial media, during the comparatively short period of observation, makes it not unlikely that the sugar fermentations may still take place when growth on fluid media becomes more active; and with this in view the experiments will, of course, be repeated after a few months have elapsed.

Reproduction is by budding, and in no case, even in the agar and gelatin hanging-drops, have mycelia been observed. In old cultures daughter cells grow and bud again without detachment from the mother cell, thus forming strings of organisms. Again, they may separate from each other by a short distance, yet remain connected by a thin, straight, bridge-like line, which takes the stain of the protoplasm. I have observed a single bud while detaching from the mother cell off and on during a period of forty-eight hours at room temperature, and seen only an almost imperceptible change in size of the bud. Multiplication, therefore, at this temperature can be only extremely slow.

The question of the classification of these organisms is not a simple one. The blastomycetes or Torulæ as a class, especially those which produce mycelia, are closely related to the Hyphomycetes; but not falling in without variation with any of the accepted classes, they have been shelved by botanists, and put, as Klöcker has expressed it, into a "Rumpelkammer" together with other forms that can not be properly placed, under the head of the "Fungi Imperfecti". Others, like Gottschlich, separate them entirely from the Hyphomycetes, and with the true yeasts or Saccharomycetes, put them under the heading of "Sprosspilze" or budding forms. In view, however, of the many transitional forms described, some of which form mycelia late or irregularly, like that of Hektoen, it does not seem that an absolute separation can be made. As to attempts at separating these forms among themselves, this seems to have been still more confusing. Casagrandi after an exhaustive attempt declares a morphological differentiation impossible. Ricketts, Weis and others have made careful comparative biological studies. Few of the forms described seem to correspond in all details. The forms under consideration seem closest to the ones described by San Felice, cultivated from adenocarcinoma, and those of Plimmer and Klein, in that they do not form mycelia, and have not, so far, fermented sugars, nor formed spores. Inasmuch, however, as Hansen, the greatest authority on yeasts, has been able materially to change forms of yeast fungi by cultivation, it does not seem justifiable after my short acquaintance with these organisms to attempt to assign them a place.

With salt solution emulsions of the organisms, five guinea-pigs, a rabbit, and a gray mouse were inoculated. The mouse, which received an enormous dose subcuta-

neously, died in forty-eight hours, and the organisms could be recovered from the heart's blood. The rabbit, inoculated intrepleurally, after three weeks began to emaciate, to lose hair, and to appear so ill that death was expected. After about ten days, it recovered and when killed, five weeks after inoculation, no lesions could be found.

Four of the guinea-pigs were killed after from four to seven weeks, none of them appearing very ill at the time. In all of them, however, lesions were found which were so similar that a single description will suffice for all. Two of the pigs inoculated intrapleurally and one intraperitoneally, showed the lesions only in the lungs and spleen, no lesions being found at the point of inoculation and both lungs being always affected. The pleura and the peritoneum in these cases were clear.

One pig inoculated subcutaneously into the abdominal wall showed lesions in the lymph nodes below the point of inoculation and two small nodules in the right lung. The fifth pig was not killed, but, after nine weeks, was found dead without apparent previous illness. This animal again showed lesions in the spleen and lungs, and also in both kidneys. It is interesting to note that this last animal was pregnant at the time of death and that no lesions could be found in either the embryos or the placenta.

Microscopically the lesions obtained have roughly the appearance of fresh miliary tubercles. They range in size from very minute points to the size of a pinhead. In the lungs they are usually close together, and where they are very numerous portions of the lung appear anemic in color and like infarcts; but microscopically this seems to have been due rather to collapse of the alveoli—areas of atelectasis. The lesions in the ab-

dominal lymph nodes of one of the animals above mentioned were extensive, and the nodes were as large as small hazel nuts, and extremely hard. These lesions were shown to consist chiefly of solid masses of organisms lying in a reticulum of connective tissue with remnants of lymphoid tissue chiefly along the periphery.

Microscopically the lesions are much alike, differing only somewhat with each organ, and corresponding in most essentials to those observed by others. In the lungs the nodules consist, in the pigs killed after four to five weeks, of a central area composed of parasites of varying size, some of them budding and some of them retaining their extraneous capsule. Between the parasites pass thin fibrils of connective tissue, in the meshes of which there is often deposited a granular mass of detritus resembling the products of coagulation necrosis as seen in tubercles. Immediately about this there are numerous young connective tissue cells, large, swollen, epithelial cells in the half destroyed alveoli. In other lesions many cells resembling the epithelioid cells of young tubercles are present. Occasionally an acidophilic cell is seen. About such nodules there is an area of extreme congestion with swelling of the alveolar epithelium and red blood cells and leucocytes in the alveoli, forming small, broncho-pneumonia-like areas, except that polynuclear leucocytic invasion is markedly slight. It is noticeable that giant cell formation is much less active in the lungs than in the other tissues involved—an observation made previously by Gilchrist.

In those that have lived a few weeks longer the area of congestion has disappeared (Pig II, lung). A firmer connective tissue capsule surrounds a clear area in which organisms, now chiefly encapsulated, lie in clear spaces,

separated by denser connective tissue partitions. In these cases some giant cell formation is visible.

In the spleen, in those animals in which resistance was still high, the histological picture is a striking one. The organisms lie in small groups, immediately surrounded by clear spaces where the tissue elements seem to have been destroyed. Necrotic cell remnants lie scattered here and there between them. The connective tissue strands which pass between the pairs and triplets of blastomycetes seem not more profuse than could be accounted for by the undestroyed normal tissue reticulum. Immediately about the periphery of the nodules, however, there is a striking formation of giant cells. These form in crescentic fronts about the single parasites and in some cases have completely enveloped them. Immediately about this is a very densely cellular area consisting chiefly of young connective tissue cells. There is very little leucocytic invasion and very little congestion. The most interesting picture of these lesions are the giant cells. These appear to be phagocytic and conform in a general way to the appearance of foreign body giant cells. Wells, and others who have worked with skin lesions, have expressed the opinion that the giant cells about the blastomycetic lesions were of epithelial origin. It is difficult to pronounce upon the origin of such complicated elements, but in part, certainly, the giant cells in our cases are strongly suggestive of fixed tissue cells, both in the form of the nuclei and in the general cell type. The question also of whether these giant cells are formed by nuclear splitting or by coalescence of cells is suggested by places which could be found in which the protoplasm of the doubly-nucleated mass was, in part, separated; and where joined, a distinct division appeared between the parts. This might be interpreted as a junc-

tion or a separation, and, indeed, the giant cell studies of Hektoen tend to show that giant cells can separate into living single elements when their work is done. But since here we are dealing with a still active process, it seems more logical to interpret these pictures as a fusion.

In pigs in which the resistance seems to have been low (Pig 5, which died), and where the organ is more generally riddled with organisms, there is little giant cell formation and very little tissue reaction of any kind in the spleen. There is much tissue necrosis between and about the lesions, and some congestion; but apart from this tissue destruction and replacement by parasites, there is little change. This is also the case in the lymph nodes of Pig 3, where the masses are almost entirely made up of parasites, necrotic tissue and reticular fibrous tissue. In cases, however, where the animal was killed while apparently well and the resistance high, giant cell formation was invariably greater.

In the lesions in the kidneys of Pig 5, the tissue reaction to the disturbing elements is strikingly absent. The small masses of parasites have destroyed tubules and parenchymatous elements in the spaces in which they lie, nothing remaining but the connective tissue framework of the organ, perhaps slightly increased and thickened. About this the nodules abut almost directly upon only slightly changed kidney tubules. Throughout all the lesions it is noticeable that the damage done is chiefly mechanical and that toxic effects upon the neighboring cells are extremely slight, if present at all.

Discussion.

Dr. James Ewing said that at the last meeting of the Society he had attempted to discuss this organism

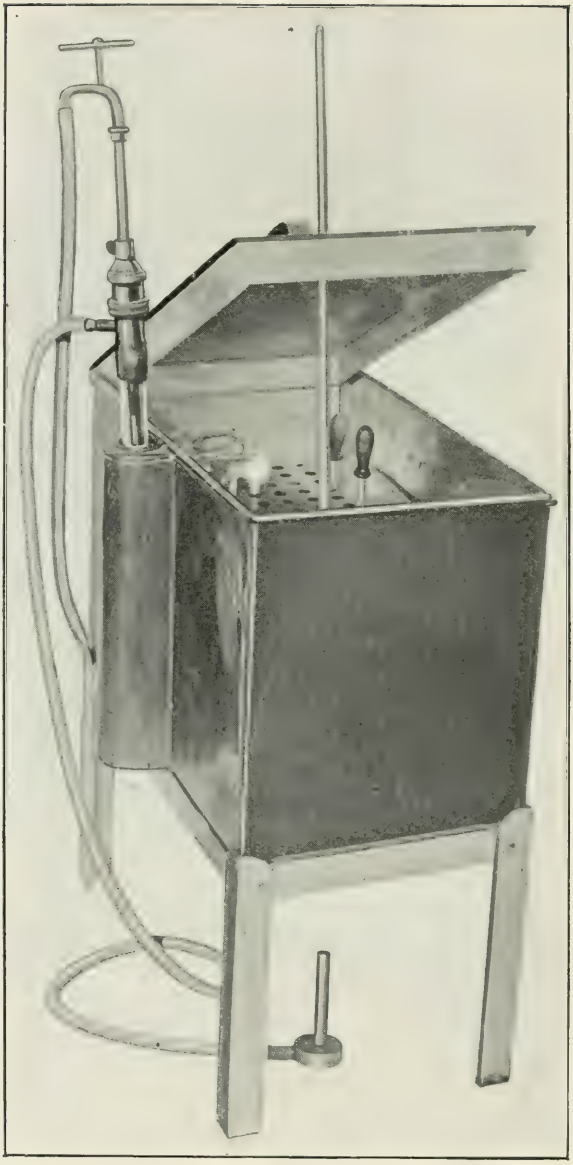
without having seen cultures of it, and it seemed necessary for him to say now that he thought there was no clear relationship between this organism and the one isolated from a case in the service of Dr. Coley. The latter organism formed abundant mycelia, grew at room temperature or even in the ice box, and had cultural and pathogenic characteristics quite distinct from this organism.

Dr. ZINSSER said that another case had come recently to his notice, occurring in St. Luke's Hospital. This was a case of abscess of the abdominal wall from which cultures were made. These showed the presence of yeast, which had definite morphological characters and showed budding. With this appeared a bacillus which stained with Gram and which he had not as yet been able to cultivate apart from the yeast.

A NEW AND CONVENIENT DESK BATH DEVISED FOR INCUBATION AT CONSTANT TEMPERATURES IN OPSONIC WORK.

A. WADSWORTH, M.D.

Dr. A. Wadsworth showed a new form of hot water bath which he had devised to run at a constant temperature, and had found very useful as an incubator in opsonic work. It was composed of two copper boxes, an inner fitting closely into an outer box which were supported by an iron stand, 8 inches high. The outer box was 14 inches long, 8 inches wide, and 9 inches high. The sides up to the level of the water, 6 inches from the bottom and 3 inches from the top, were made double



Bath For Opsonic Work.

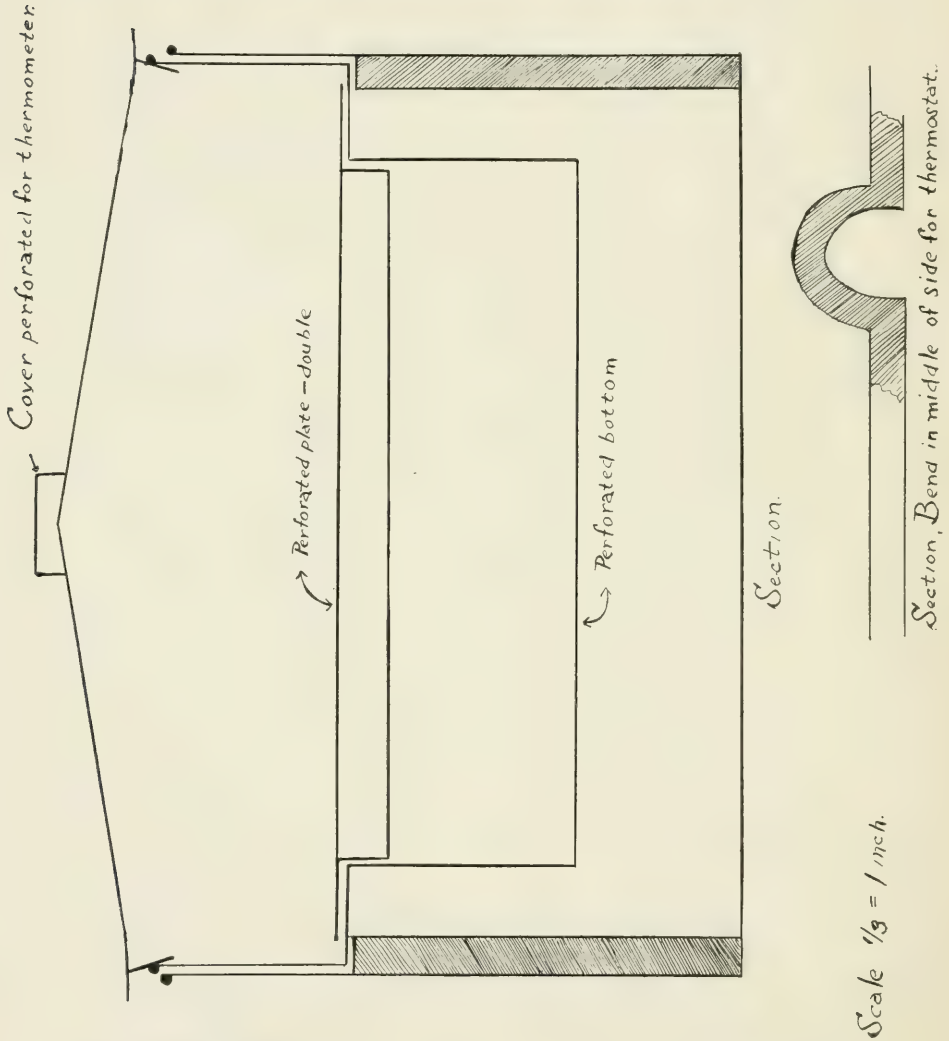
About One-fourth Size.

walled, and the space packed with asbestos to prevent too rapid loss of heat. A shelf, ½ inch wide, was thus formed inside the box at the level of the water. On this rested the inner box, the walls of which, 3 inches from the top, were bent inward 1½ inches horizontally to form the lower submerged part of this box, 11x5x4 inches, thus making a water jacket of 1½ inches at the sides and 2 inches below. The bottom of the inner box was perforated at regular intervals, the holes being $\frac{3}{16}$ inches, to allow quick convection and the passage of the capillary tubes used in opsonic work. On the broad shelf of the inner box rested a double plate, also perforated at regular intervals, with larger holes opposite those in the bottom. The size of these holes may be accommodated to the tubes used in the experiments. In this instance they were ⅜ of an inch in diameter.

When greater depth to the bath was desired the inner box was lifted and supported on two brass strips. These were bent downward an inch at a right angle to fit across the top of the outer box at the ends, thereby increasing the depth of the bath three inches, or they were placed on the ½ inch shelf of the long side of the outer box to give an intermediate elevation. However, these procedures were rarely necessary as the bath could be used with the cover off, and the sealing of the water jacket was more complete when the inner box rested on the shelf.

To make a place for the thermoregulator, the wall of the outer box was bent outward 1¼ inches at the middle of the long side. Dr. Wadsworth used a mercury regulator carefully adjusted with alcohol and ether to secure the most delicate control for such temperatures as were required in his experiments. This offset, to a large extent, changes occurring in the gas pressure and proved

to be a useful precaution. Fluctuations in temperature were further controlled by a thin iron plate placed across the stand just above the flame, distributing the heat


Cover perforated for thermometer
Perforated plate – double
Perforated bottom
Section
Section, Bend in middle of side for thermostat.
Scale 1/3 = 1 inch.

over the bottom of the bath. A cover was also made to fit the top of the boxes in any of the arrangements above described. This cover was perforated for a thermometer.

Dr. Wadsworth used thermometers of special constuction; some 12, others 18 inches long. They were graduated to read in tenths between 30° and 45° C., with a maximum error of .05° C.

Such a hot water bath may be set upon a laboratory desk, close at hand, and maintained at any desired temperature with comparatively little fluctuation. Over long periods of observation variations of 0.3° C. were noted, but in experiments of a few hours duration this was exceptional. The exposure, in this water bath, of cultures, of opsonic or other tests, proved to be far more reliable than in the air incubators, which often varied greatly during the exposure and at different times.

In Dr. Wadsworth's experience the bath had proved to be a convenient and extremely valuable accessory to experimental laboratory work, not only in the routine opsonic tests but, especially, when accurate determina tions were desired of the opsonic, agglutinative, and lytic activity of sera, or of the growth and thermal death point of micro-organisms at different temperatures, and also for pasteurization.